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EXAMINER

ELLIOTT IV, BENJAMIN H

ART UNIT	PAPER NUMBER
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2419

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/574,350

Applicant(s)

SCHWOERER, LUDWIG

Examiner

BENJAMIN ELLIOTT

Art Unit

2419

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 April 2006.
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-34 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1-8 and 15-34 is/are rejected.
7) ☒ Claim(s) 9-14 is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-893)
4) ☐ Interview Summary (PTO-413)
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____
Paper No(s)/Mail Date 4/03/2006

DETAILED ACTION

1. Claims 1-34 have been examined and are pending.

Information Disclosure Statement

2. An initialed and dated copy of the Applicant's IDS form 1449 submitted on 4/03/2006 is attached to the instant office action.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 25 and 33-34 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 25, The language used "...**and synchronization into the bursts is adapted to be based on the indicated pilot position for finding an indication indicating the OFDM symbol**" is unclear with regards to what "indication" the applicant is referring.

Regarding claims 33-34, it is not clear what is meant by "program code means"; if it is not a program code, then what is it?

Claim Rejections - 35 USC § 101

5. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 33 and 34 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. A computer program per se is not statutory." is not recited as stored in tangible computer storage medium, executed by a machine or processor to provide necessary functional and structural interrelationship and to produce useful, concrete and tangible result(s).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. Claims 1-23 and 26-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 6,359,938 B1 to Keevill (hereinafter "Keevill") and further in view of US Patent Publication 2005/0174929 A1 to Hayashi (hereinafter "Hayashi").

As per Claims 1 and 29-32, Keevill discloses **a receiver for receiving a multi-carrier transmission, wherein the multi-carrier transmission comprises various symbols, each symbol comprising a plurality of carriers** (Abstract; Col. 6, lines 39-43. An accumulation of phase errors is made between first and second symbols containing a plurality of carriers.), **the receiver comprising:**

means for accessing at least one symbol which is adapted to establish a distinguishable power based pattern for pilot carriers in the at least one symbol (Col. 8, lines 12-15. Pilot carriers are transmitted at a different power from data carriers. Col. 4, lines 43-45. A digital receiver is used to receive the multi-carrier signals.),

means for establishing power accumulation sums for possible pilot carriers of the symbol based on the pattern (Col. 8, lines 20-24. Magnitudes that correlate to powers of scattered pilot carriers are accumulated in accumulators. Col. 4, lines 43-45. A digital receiver is used to receive the multi-carrier signals.),

and means for determining a power accumulation sum maximum of the sums indicating a pilot carrier position (Col. 8, lines 27-32. Accumulators add the absolute values of the powers and store the sums in accumulators. Col. 8, lines 34-37. The identity of the accumulator containing the highest values of magnitudes correlating to

powers of carriers is known. Col. 4, lines 43-45. A digital receiver is used to receive the multi-carrier signals.).

Keevill is silent on the pilot carrier symbols having a distinguishable power based pattern.

However, Hayashi teaches a method and receiving device wherein the channel response calculation section (Section 22, Figure 15) contains a differential power calculator (237) that outputs a power corresponding to a change amount in the channel responses for pilot signals in one cycle or N symbols ([0205-0206]). Figure 2 is an interpretation of the pattern of symbols (P1 = pilot symbols), generating a matrix with horizontal axis to the frequency, and the vertical axis to the time ([0084-0085]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Keevill to include symbol patterns taught by Hayashi, to properly determine channel responses for data signals that existing between pilot signals in a pattern, wherein the response is based on the differences of power values ([0088], [0206]).

As per Claim 2, Keevill discloses **a receiver according to claim 1, wherein one of the possible pilot carriers is adapted to comprise the maximum in accordance with the predetermined pattern for the pilot carriers within the symbol** (Col. 8, lines 27-32. Accumulators add the absolute values of the powers and store the sums in accumulators. Col. 8, lines 34-37. The identity of the accumulator containing the highest values of magnitudes correlating to powers of carriers is known.).

Keevill is silent on the pilot carrier symbols having a distinguishable power based pattern.

However, Hayashi teaches a method and receiving device wherein the channel response calculation section (Section 22, Figure 15) contains a differential power calculator (237) that outputs a power corresponding to a change amount in the channel responses for pilot signals in one cycle or N symbols ([0205-0206]). Figure 2 is an interpretation of the pattern of symbols (P1 = pilot symbols), generating a matrix with horizontal axis to the frequency, and the vertical axis to the time ([0084-0085]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Keevill to include symbol patterns taught by Hayashi, to properly determine channel responses for data signals that existing between pilot signals in a pattern, wherein the response is based on the differences of power values ([0088], [0206]).

As per Claim 3, Keevill is silent on **a receiver according to claim 1, wherein the position of the possible pilot carriers is adapted to be based on the pattern in such a way that carrier indexes having a pilot in a matrix of certain number of symbols are adapted to be selected, and the corresponding carrier index position within the accessed symbol is accordingly adapted to be selected.**

However, Hayashi teaches, in Figure 2, an interpretation of the pattern of symbols (P1 = pilot symbols), generating a matrix with horizontal axis to the frequency, and the vertical axis to the time ([0084-0085]). The index in the carrier direction (along the frequency axis) is called a carrier index k, and the index in the symbol direction

(along the time axis) is called a symbol index s . Channel responses are obtained based on these pilot signals.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Keevill to include symbol patterns taught by Hayashi, to properly determine channel responses for data signals that existing between pilot signals in a pattern, wherein the response is based on the differences of power values ([0088], [0206]).

As per Claim 4, Keevill discloses **a receiver according to claim 1, wherein every predetermined carrier of the symbol is adapted to be selected for the means for establishing the power accumulation sums** (Col. 5, lines 60-67; Col. 6, lines 1-9. An accumulation of sums is made based on the predetermined magnitude of the carriers, and a proper channel response is chosen.).

As per Claim 5, Keevill discloses **a receiver according to claim 4, wherein every fourth carrier of the symbol is adapted to be selected for the means for establishing the power accumulation sums** (Col. 35, lines 47-49. Phase differences of carriers are computed based on every fourth character.).

As per Claim 6, Keevill discloses a receiver according to claim 1, wherein the distinguishable power based pattern comprises boosted pilot carriers compared to data carriers of the symbol (Col. 30, lines 32-34. The pilot carrier amplitudes are $4/3$ that of data carrier amplitudes.).

As per Claim 7, Keevill discloses a receiver according to claim 6, wherein the pilots are boosted in amplitude of $4/3$ compared to the data carriers (Col. 30, lines 32-34. The pilot carrier amplitudes are $4/3$ that of data carrier amplitudes.).

As per Claim 8, Keevill discloses **a receiver according to claim 1, wherein the means for establishing power accumulation sums comprises:...**

the means for determining comprises:

means for detecting the power accumulation maximum magnitude from the first, second, third, and fourth power accumulation sums for indicating the current scattered pilot raster position (Col. 8, lines 27-32. Accumulators add the absolute values of the powers and store the sums in accumulators. Col. 8, lines 34-37. The identity of the accumulator containing the highest values of magnitudes correlating to powers of carriers is known. Col. 4, lines 43-45. A digital receiver is used to receive the multi-carrier signals.).

Keevill is silent on means for performing a first power accumulation sum for first possible pilot carrier positions of the symbol, means for performing a second power accumulation sum for second possible pilot carrier positions of the symbol, means for performing a third power accumulation sum for third possible pilot carrier positions of the symbol, means for performing a fourth power accumulation sum for fourth possible pilot carrier positions of the symbol.

However, Hayashi teaches the four points are grouped into two, and linear operations are performed on the groupings representing channel responses for the one through four groupings of symbols ([0184]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Keevill to include accumulating the sums of carrier symbols taught by Hayashi, to properly determine channel responses that are small in error from actual channel responses without increasing the circuit size ([0185]).

As per Claim 15, Keevill discloses **a receiver according to claim 1, wherein the means for accessing comprises:**
means for obtaining a first symbol of the transmission,
means for obtaining another symbol in relation to the first symbol (Col. 6, lines 54-59. An accumulator is coupled to memory allowing phase differentials to be compared between a second symbol and a first symbol.).

As per Claim 16, Keevill discloses **a receiver according to claim 15, wherein the accessed symbols comprise currently received symbol and certain predetermined another symbol preceding or following the currently received symbol** (Col. 29, lines 17-22. Newly accumulated values of carriers are stored with known values. The carrier with the largest peak is the first active carrier in the symbol.).

As per Claim 17, Keevill discloses **a receiver according to claim 15, wherein the accessed symbols comprise currently received symbol and certain predetermined another symbol preceding or following the currently received symbol** (Col. 29, lines 17-22. Newly accumulated values of carriers are stored with known values. The carrier with the largest peak is the first active carrier in the symbol.).

Keevill is silent on **so that the correspondence pattern is adapted to be established between pilot carriers of the symbols for possible carrier positions within the matrix of the symbols.**

However, Hayashi teaches, in Figure 2, an interpretation of the pattern of symbols (P1 = pilot symbols), generating a matrix with horizontal axis to the frequency, and the vertical axis to the time ([0084-0085]). The index in the carrier direction (along the frequency axis) is called a carrier index k , and the index in the symbol direction (along the time axis) is called a symbol index s . Channel responses are obtained based on these pilot signals.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Keevill to include symbol patterns taught by Hayashi, to properly determine channel responses for data signals that existing between pilot signals in a pattern, wherein the response is based on the differences of power values ([0088], [0206]).

As per Claim 18, Keevill discloses **a receiver according to claim 15, wherein the certain predetermined another symbol comprises a consecutive symbol preceding or following the currently received symbol** (Col. 8, lines 51-56. A mean phase difference is conducted between corresponding pilot symbols of successive symbols of the digital signal.).

As per Claim 19, Keevill discloses **a receiver according to claim 15, wherein the means for establishing power accumulation sums comprises: means for establishing power accumulation sums for possible pilot carriers of**

the first symbol (Col. 8, lines 20-24. Magnitudes that correlate to powers of scattered pilot carriers are accumulated in accumulators. Col. 4, lines 43-45. A digital receiver is used to receive the multi-carrier signals.), **and the receiver further comprises:**

means for establishing another power accumulation sums for possible pilot carriers of the another symbol (Col. 8, lines 34-41. A second accumulator corresponding to a second carrier wherein sums are stored is compared to a first accumulator.),

and means for establishing cumulated power sums from the power accumulation sums and the another power accumulated sums (Col. 8, lines 34-41. The receiver contains accumulators for storing sums.),

and the means for determining the power accumulation sum maximum comprises:

means for determining the power accumulation sum maximum of the cumulated power sums for indicating the current pilot carrier position (Col. 8, lines 34-36. The accumulator storing the highest accumulated sums is identified.).

As per Claim 20, Keavill discloses **a receiver according to claim 19, wherein the means for establishing another power accumulation sums comprises:**
means for performing a first another power accumulation sum for first possible pilot carrier positions of the another symbol ,
means for performing a second another power accumulation sum for second possible pilot carrier positions of the another symbol,
means for performing a third another power accumulation sum for third possible

pilot carrier positions of the another symbol,
means for performing a fourth another power accumulation sum for fourth
possible pilot carrier positions of the another symbol (Figure 43; Figure 48; Col. 35, lines 24-31 and lines 35-50. From Figure 43, the accumulation block, 600, accumulates sums of the current symbol minus the symbol that preceded it by 4 (this correlates to a power accumulation sum of first, second, third, and fourth order). From Figure 48, a slope of best fit is determined from these accumulation sums every fourth symbol.).

As per Claim 21, Keevill discloses **a receiver according to claim 19, wherein for the means for establishing cumulated power sums from the power accumulation sums and another power accumulation sums, the respective power accumulation sums of the first and the another symbol are adapted to be selected in such a way that the pilot carriers of the symbols have a correspondence for the respective sums** (Col. 8, lines 33-41 and lines 42-46. Sums are stored in accumulators. Intervals between first and second carriers are determined. Positions of the first and second carriers are then compared.).

As per Claim 22, Keevill discloses **a receiver according to claim 20, wherein means for establishing cumulated power sums from the power accumulation sums and the another power accumulated sums comprises:**
means for performing a first cumulated power sum for the first power accumulation sum of the first symbol and the fourth another power accumulation sum of the another symbol,
means for performing a second cumulated power sum for the second power

accumulation sum of the first symbol and the first another power accumulation sum of the another symbol,
means for performing a third cumulated power sum for the third power accumulation sum of the first symbol and the second another power accumulation sum of the another symbol, and
means for performing a fourth cumulated power sum for the fourth power accumulation sum of the first symbol and the third another power accumulation sum of the another symbol (Figure 43; Figure 48; Col. 35, lines 24-31 and lines 35-50. From Figure 43, the accumulation block, 600, accumulates sums of the current symbol minus the symbol that preceded it by 4 (this correlates to a power accumulation sum of first, second, third, and fourth order). From Figure 48, a slope of best fit is determined from these accumulation sums every fourth symbol.).

As per Claim 23 Keevill discloses **a receiver according to claim 1, wherein the multi-carrier transmission comprises OFDM transmission uses time-slicing** (Col. 11, lines 21-23. A difference signal is found when two samples are sent separated by a time interval (time-sliced) equal to a fast Fourier transform that is applied.), **the symbol comprises OFDM symbol** (Col. 33, lines 58-61. The phase slope is determined from the phase difference of OFDM symbols.), **and the plurality of carriers comprise data carriers and scattered pilot carriers** (Col. 6, lines 22-26. Channel estimation is performed using pilot carriers and data carriers.).

As per Claim 26, Keevill discloses **a receiver according to claim 1, wherein the receiver further comprises:**

a Fast Fourier Transform (FFT) means for FFT transformation of the received transmission for obtaining the symbol (Col. 11, lines 21-25. A difference signal is determined for samples separated by a period of time equal to the size of the fast Fourier transform applied.),

accumulator means for accumulating power accumulation sum results (Col. 8, lines 20-24. Magnitudes that correlate to powers of scattered pilot carriers are accumulated in accumulators. Col. 4, lines 43-45. A digital receiver is used to receive the multi-carrier signals.),

and Channel Estimation means (CHE) for further continuing the reception of the transmission (Col. 5, lines 60-61. The receiver provides for channel estimation and correction.).

As per Claim 27, Keevill discloses **a receiver according to claim 1, wherein computational resources for performing the operations of at least one of the means comprises the same computational resources which are adapted to perform a post-FFT acquisition in the receiver** (Figure 14, Col. 18, lines 29-32. Acquisition and control of the FFT window is performed in block 166. FFT computations are performed in the FFT calculation circuitry block 168.).

As per Claim 28, Keevill discloses **a receiver according to claim 1, wherein a buffer means of the receiver is adapted to contain all said means** (Col. 12, lines 18-21. Samples are buffered for an active interval in a memory.).

As per Claim 33, Keevill discloses **a computer program comprising computer program code means adapted to perform the steps of claim 32 when said**

program is run on a computer (Tables 4-39; Columns 38-59. Partial code is included as part of the application.).

As per Claim 34, Keevill discloses **a computer program product as claimed in claim 33 embodied on a computer readable medium** (Tables 4-39; Columns 38-59. Partial code is included as part of the application. As code is included, it would have been obvious to one of ordinary skill in the art to include this code on a computer readable storage medium.).

9. Claims 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Keevill and Hayashi as applied to claim 1 above, and further in view of US Patent 6,115,427 to Calderbank (hereinafter "Calderbank").

As per Claim 24, Keevill and Hayashi are silent on **a receiver according to claim 1, wherein the multi-carrier transmission comprises time slicing based power saving based on bursts, and a synchronization of the receiver into the bursts is adapted to be based on the indicated pilot position for finding index of the received symbol.**

However, Calderbank teaches bursts are transmitted in time slots. Each burst starts with a synchronization sequence for timing and frequency. The transmitter adds a two-symbol pilot sequence to estimate the channel. The sequences are translated as

orthogonal sequences. (Col. 17, lines 65-67; Col. 18, lines 1-11). The samples are correlated to pilot positions (Col. 18, lines 26-28).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Keevill and Hayashi to include time-slicing bursts for indicated pilot positions as taught by Calderbank to minimize the overall system delay by avoiding the need to wait for future bursts in order to estimate the channel, as only the pilot symbols per burst are used (Col. 18, lines 54-57).

As per Claim 25, Keevill is silent on **a receiver according to claim 1, wherein the multi-carrier transmission comprises DVB transmission using time slicing based on bursts, and synchronization into the bursts is adapted to be based on the indicated pilot position for finding an indication indicating the OFDM symbol.**

However, Hayashi teaches multi-carrier transmissions using DVB ([0042], [0224]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings of Keevill and Hayashi to include DVB transmission in the multi-carrier transmission to determine channel responses from known pilot signals ([0224]).

Keevill and Hayashi are silent on using time slicing using bursts to synchronize into the bursts an indication of an OFDM signal.

However, Calderbank teaches bursts are transmitted in time slots. Each burst starts with a synchronization sequence for timing and frequency. The transmitter adds a two-symbol pilot sequence to estimate the channel. The sequences are translated as

orthogonal sequences. (Col. 17, lines 65-67; Col. 18, lines 1-11). The samples are correlated to pilot positions (Col. 18, lines 26-28).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Keevill and Hayashi to include time-slicing bursts for indicated pilot positions as taught by Calderbank to minimize the overall system delay by avoiding the need to wait for future bursts in order to estimate the channel, as only the pilot symbols per burst are used (Col. 18, lines 54-57).

Allowable Subject Matter

10. Claims 9-14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

11. Prior art made of record not relied upon:

EP 1361720 A1 to Asjadi describes a multi-carrier modulated symbol receiver.

WO 2004002101 A1 to Henriksson describes a method and system for receiving a multi-carrier signal.

US Patent 7,283,498 B2 to Ro describes a method and apparatus for allocating a pilot carrier in an OFDM system.

US Patent Publication 2004/0228270 A1 to Chen et al describes processing an OFDM signal.

US Patent 7,313,209 B2 to Antoine et al describes a method to arrange a multi-carrier system.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BENJAMIN ELLIOTT whose telephone number is (571)270-7163. The examiner can normally be reached on Monday thru Friday, 8:00 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hassan Kizou can be reached on (571)272-3088. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/B. E./
Examiner, Art Unit 2419

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Supervisory Patent Examiner, Art Unit 2419